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$$y\sqrt{1+\frac{dy^2}{dx^2}}.$$

Now, all curves of the form $r^m=a^m\cos m\theta$ have their pedal equations in the form $r^{m+1}=a^mp$....[a].

It is plain that the given curve may be so expressed. The equation [a] then gives for the differential equation of the locus of the pole

$$\left(y\sqrt{1+\frac{dy^2}{dx^2}}\right)^{n+1}=a^ny,\text{ or, }\frac{dy}{dx}=\surd[a^{2n/(n+1)}-y^{2n/(n+1)}\div y^{n/(n+1)},$$

in which $dy/dx=\cot\varphi$ from the form of the given curve.

Then $y=a\sin^{(n+1)/n}\phi$, $\dfrac{dy}{d\phi}=\dfrac{n+1}{n}a\sin^{1/n}\phi\cos\phi$....[$b$].

Also, $\dfrac{dx}{dy}=\tan\phi$, $\dfrac{ds}{dy}=\dfrac{1}{\cos\phi}$; then $\dfrac{ds}{d\phi}=\dfrac{n+1}{n}a\sin^{1/n}\phi$....[$c$].

But this gives the radius of curvature in the locus of the pole, which again is the length of arc corresponding in the evolute, which vanishes with ϕ.

$\therefore$ the evolute is $s=\dfrac{n+1}{n}a\sin^{1/n}\phi$, as required.

Also solved by *G. B. M. ZERR*.

142. **Proposed by J. SCHEFFER, A. M., Hagerstown, Md.**

Solve the differential equation,

$$[a-x]\frac{dz}{dx}+[b-y]\frac{dz}{dy}=c-z.$$

Solution by G. B. M. ZERR, A. M., Ph. D., The Temple College, Philadelphia, Pa.; WILLIAM HOOVER, A.M., Ph. D., Ohio University, Athens, O.; and the PROPOSER.

Putting, as usual, $dz/dx=p$, $dz/dy=q$, and then comparing the given equation with $Pp+Qq=R$, we have $P=a-x$, $Q=b-y$, $R=c-z$.

Then, $\dfrac{dx}{P}=\dfrac{dz}{R}$ gives $\dfrac{dx}{x-a}=\dfrac{dz}{z-c}$, and

$$\frac{dy}{Q}=\frac{dz}{R}\text{ gives }\frac{dy}{y-b}=\frac{dz}{z-c}.$$

These equations give $\dfrac{x-a}{z-c}=\alpha$, $\dfrac{y-b}{z-c}=\beta$; so that the solution is

$$\frac{b-y}{c-z}=\phi\left(\frac{a-x}{c-z}\right).$$

Solved similarly by *LON C. WALKER*.